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SUCKING INSECTS AND MITES OF THE APPLE.

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SUCKING INSECTS AND MITES INJURIOUS TO THE APPLE AND PEAR.

By W. H. Brittain, Provincial Entomologist.

While spraying for biting insects and fungous diseases has, for a number of years, been part of the ordinary routine in practically all commercial orchards, little attention has been paid to the treatment of insects of the sucking type. It is possibly due to this fact, that the damage occasioned by certain of these pests has recently increased, sometimes to an alarming extent, and has caused something like consternation in certain quarters. Numbers of fruit growers who have solved the problem of the control of such troubles as apple scab, budmoth, canker worm, etc., are pessimistic regarding the successful treatment of various sucking insect whose ravages have begun to be recognized in their orchards.

It must be remembered that, with some exceptions, nothing has been done until quite recently to check the increase of this class of pests. Even at the present time the use of sprays to control them has not become general and as too often applied they are, unfortunately, little else than a waste of good material. It is therefore not at all suprising that we have periodic outbreaks of various sucking insects and that the loss occasioned by some forms has been steadily increasing from year to year. When the same amount of attention has been paid to the treatment of these insects that has been accorded to that of fungous diseases and biting insects, and when the lesson of care and thoroughness has been well learned, we may expect to see a marked decrease in the injury from this source.

Plant Bugs.

Three species of plant bugs are usually found in orchards in Nova Scotia, viz: the Tarnished Plant Bug (*Lygus pratensis*), the False Apple Red Bug (*Lygidea mendax*) and the Green Apple Bug (*Lygus communis* var. *novascotiensis*). The first of these is a very general feeder and injures many different cultivated and wild plants. As a fruit pest, however, it is of minor importance in Nova Scotia. The False Apple Red Bug is known elsewhere as a serious pest of the apple, but it has never occurred in sufficient numbers in this province to be worthy of any special notice. The Green Apple Bug, however, is one of the most serious enemies of the apple and pear, and undoubtedly the most difficult to control of any with which the fruitgrower has to contend.

The Green Apple Bug.

(*Lygus communis* var. *novascotiensis* Knight).

The young insects, or nymphs, of this species are pale or slightly yellowish insects, about 1-25 of an inch long when first hatched. In the third nymphal stage, they become a light green and when full grown they are slightly yellowish about the head and thorax and measure 1-6 of an inch in length. The newly emerged adult is a delicate insect $\frac{1}{4}$ of an inch in length and very pale in color, which, however, soon deepens until it becomes a combination of light and dark browns. In appearance it is strikingly like the tarnished plant bug (*Lygus pratensis*) and is frequently mistaken for this species.

Life History and Habits.

The eggs are laid beneath the bark of the apple, pear and quince, and the emergence of the insect from the egg begins shortly before the apple blossoms open in the spring and continues through the blossoming period. The period of greatest emergence corresponds to the time of full bloom of the Bartlett pear, or just as the Gravenstein apples are coming into bloom. The bugs remain in the immature or nymphal form for about one month, when they reach the adult or winged stage.

The young bugs or nymphs are very active in their habits and possess a remarkable ability to hide themselves in inaccessible places. As they increase in size they exhibit an increasing tendency to drop to the ground when disturbed. Here they are able to subsist on various weeds and grasses growing beneath the tree until they reach the adult state, whereupon they fly back to feed upon the fruit and to deposit their eggs in the twigs. The nymphs feed freely upon the leaves, stems and blossoms, but fruit is preferred to other food.

The adults are active insects and can fly considerable distances. In feeding they prefer a diet of fruit and that of pears is most attractive to them. Bugs from surrounding apple trees, will fly to the pears in large numbers for the purpose of feeding, though the greater number later return to the apple to deposit their eggs.

Injuries.

Young leaves show the work of the bug in the form of purplish spots which, as the leaf expands, disappear, but

perforations through the leaves mark the points of puncture. Badly attacked leaves have a ragged, frayed appearance. The new growth of the current season is often killed by the repeated punctures of large numbers of bugs and lumpy scars mark the points of punctures on the twigs. Blossoms shrivel and die as a result of their attacks and affected apples are scarred and twisted, large numbers dropping to the ground. Injured pears are covered with corky scars and hard flinty kernels extend into the pulp. Plums are frequently injured by flying adults, whose punctures cause a copious exudation of gum from the infested fruit. Taken altogether the damage done by this insect and the elusiveness of its habits, make it the most serious enemy of our fruit growers.

Control.

1. Thoroughly prune all infested trees so that all parts will be readily accessible to the spray.

2. Where the infestation is severe, band with tangle-foot to prevent the reascent of those insects that have fallen to the ground. Likewise the grass and weeds in the orchard must be altogether eradicated, so that nothing is present beneath the tree to serve as food for such insects..

3. Apple trees should be sprayed with nicotine sulphate (Blackleaf 40) just before the blossoms open and again if necessary, just after they fall. In the case of very light infestations, one spraying before the blossoms without banding, will give satisfactory control if timed correctly and applied with care and thoroughness. To control the pest on pears, it must first of all be destroyed in the near-by apple trees, since much of the damage done to pears is from bugs flying from such trees. If the pear trees are infested by the immature bugs, one spray immediately the blossoms fall is usually sufficient.

4. A very heavy, drenching, driving spray is necessary, Use a drive nozzle and a pressure of at least 200 lbs. Follow up each limb individually and spray it from every angle.

Leaf Hoppers.

Three species of leaf hoppers are commonly found in Nova Scotia orchards viz; the Black Apple-Leaf Hopper (*Idiocerus fitchi* Van D.) the Rose-leaf Hopper (*Empoa rosae* Linn.) and the Apple-leaf Hopper (*Empoasca mali* LeB.) The first of these, though not uncommon, cannot be considered a pest of sufficient seriousness to warrant special treatment.

The other two species resemble each other so closely in appearance, life-history and injuries that they can be conveniently considered together.

The young of the rose-leaf hopper are pale yellow in color, the adult being yellowish white and about 1-8 of an inch in length. Both young and adults of the apple-leaf hopper are pale green. The young run when disturbed, but the adults in addition to the power of flight can jump considerable distance.

Life History and Habits.

Both winter in the egg state, the eggs being laid obliquely in the bark of the twigs, a blister-like swelling marking the spot where one or two eggs are deposited. The eggs hatch in the spring beginning some time after the buds burst, continuing through the blossoming period, and for some time thereafter, in certain seasons. The young insects require from four to five weeks to complete their development, after which summer eggs are laid in the petioles, midribs and larger veins of the leaves. There is a complete second brood of both species in Nova Scotia, the young of this brood taking from three to four weeks to complete their development. The adults of this generation deposit the eggs, which carry the species through the winter.

The chief damage is done to the foliage of nursery stock and to young apple trees, but only in unusually severe cases is it necessary to adopt control measures especially for these insects. The feeding punctures result in the appearance of small white spots on the surface of the leaf. When the insects are numerous these spots run together, giving the infested leaf a blotched appearance. Injury sometimes, though rarely, results from the deposition of the eggs in the twigs, but more often no apparent damage is done in this way.

Control.

The slight amount of damage usually done, will rarely warrant the cost of spraying. Where the Green Apple Bug is present, the spray for this pest will destroy the hoppers. Nicotine sulphate (Blackleaf 40) employed in the usual strength is very effective, and should be applied after all the insects have hatched, but before they reach the winged state.

Plant Lice or Aphids.

Four species of plant lice or aphids are found infesting orchards in Nova Scotia. They are the Green Apple Aphid (*Aphis pomi* DeG.), the Grain Aphid (*Siphocoryne avenae* Fabr.) the Rosy Apple Aphid (*Aphis sorbi* Kalt.) and the Woolly Apple Aphid (*Eriosoma lanigera* Hausm.). The first three of these are leaf feeding species, the fourth feeds upon the bark of the twigs, smaller limbs and occasionally the roots and only rarely attacks the leaves.

The Green Apple Aphid spends its entire life upon the apple. The Grain Aphid and the Rosy Aphid migrate to other plants, the former to various grasses, the latter to species of plantain (*Plantago* spp.) during the summer, and there spend a portion of their life history. The woolly apple aphid normally spends part of its life on the apple and part on the elm, but a proportion of the species keep breeding continuously on the apple, without alternation of food plants.

The Green Apple Aphid.

(*Aphis pomi* DeG.)

The aphid of this species are small green forms, rarely reaching more than 1-15 of an inch in length. They are more or less pear shaped in form. The eggs are small, black and glistening.

Life History.

The winter is passed in the egg state upon the twigs. Hatching commences about the time that the leaves about the blossom clusters begin to show green, the greater proportion emerging within a week, but continuing in diminishing numbers until the time of blossoming. From 6 to 9 generations are passed on the apple, all but the last being composed entirely of females that give birth to their young alive. The last generation consists of true male and female forms, the latter being responsible for the eggs from which the next year's generation springs. A certain proportion of each summer generation consists of winged forms that spread the species from tree to tree and from orchard to orchard.

Injuries.

The commonest seat of injury from this source is to the tender, succulent shoots. The growth of the twigs is checked and may even be stopped altogether, and some rapidly growing shoots are curiously curled or twisted as a result of the insect's work. The leaves are curled, but not so severely as in the case of the Rosy Aphis.

In severe cases the developing fruit may be attacked and gnarled and dwarfed as a result of their work. Periodically, an epidemic of Green Aphis may be expected in which serious injury to the fruit will occur, but ordinarily the damage done to the developing fruit early in the season is slight. Since this species passes its life entirely on the apple it may, though comparatively scarce in the spring months, increase to such an extent as to do severe injury to the fruit before picking time.

The Rosy Apple Aphis.

(*Aphis sorbi* Kalt.)

This insect gets its name from its color, the wingless summer forms having a rosy or pinkish tinge. The egg resembles that of the Green Aphis.

Life History.

The first three generations are spent on the apple, the females of the 3rd generations developing into so-called "spring migrants" that fly to plantains (*Plantago* spp.) where several generations are produced. In the fall the species returns to the apple where the winter eggs are deposited. Females of the first generation are very prolific and give birth to from 100 to 300 young each, and those of the second generation average more than 100 young each. Though the eggs are rarely abundant, it therefore often happens, that these insects soon become very numerous in the orchard.

Injuries.

This species causes much more severe injury to the leaves than the species previously discussed. The insects as they hatch from the eggs, cluster upon the opening bud tips and on the undersides of the unfolding leaves and, as these develop, they curl around the insect after the fashion of a paper cylinder. In feeding these insects show a marked preference

for the fruit clusters, where they swarm on the undersides of the leaves and even on the flower buds and developing fruit. The result is that the fruit is reduced in size to a greater or less extent, forming clusters of so-called "gnarls" hanging from infested trees, for, strange to say, apples that normally drop remain in an undeveloped state upon the tree. The dwarfing of the fruit may be brought about by the injury to the leaves that surround the cluster, but the fruit itself is freely attacked and badly distorted and twisted as a result. The damage is practically all done early in the season, since this species forsakes the apple for its alternate food plant in the 3rd generation.

The Grain Aphis.

(*Siphocoryne avenae* Fab.)

This aphis is frequently mistaken for the Green Aphis but can readily be distinguished from it by its brighter green color and by the bands of darker green upon its abdomen.

Life History.

These insects appear about a week before the preceding species, hatching out from their oval shiny eggs and clustering at the tip of the buds. Only one complete generation is spent on the apple, since a considerable proportion of the second generation and all the third generation, migrate to grasses where the rest of the summer is passed. Like the Rosy Aphis, the egg is deposited by the sexual female upon the apple twigs.

Injuries.

During the past three years this insect has never been observed doing any serious injury to the apple. Though present in fairly large numbers early in the spring of this year, they disappeared before any appreciable damage had been accomplished. On the whole, this insect cannot be considered to be a serious orchard enemy.

The Woolly Apple Aphis.

(*Eriosoma lanigera* Hausm).

Bluish white, cottony patches are frequently noticed upon old wounds or the stubs of limbs, early in the season, or upon the younger growth in late summer or fall. A

close examination reveals the fact that these patches are made up of numbers of small reddish-brown aphids, each of which is covered with a white waxy secretion.

Life History.

In Nova Scotia this insect passes four or five generations upon the apple, the last generation hibernating under pieces bark or any available shelter upon the tree. It has been shown however, that normally the winter is passed in the egg state upon the elm, and the first three spring generations are passed upon that plant. The insects of the third generation are migrants that fly to the apple, where three more generations develop. This last generation are also migrants that return to the elm when the sexual forms are produced. Up to the present we have found that the most important source of spring infestation of the apples is from the females that hibernate on the trees.

Injuries.

The Woolly Aphis in Nova Scotia is only rarely responsible for any serious damage to apple trees. Damage to roots, which is the most serious form that the injury takes in some countries, is not common here. Open cankers on the twigs or limbs where the insect is at work, or occasionally gall-like swellings are the principal results of their work.

Control of the Orchard Aphids.

The most effective time to spray for the green, the rosy and the grain aphid is just when the bud tips are showing green, when they will be found clustering at the tips of the buds. Nicotine sulphate (Blackleaf 40) should be used, in the strength of 1 pint to 100 gals. A heavy, drenching, driving spray should be employed and no insects left uncovered with the liquid. The addition of a good spreader such as flour paste, materially improves the effectiveness of the spray.

When not too numerous, the most satisfactory method of treating the woolly aphid is simply to paint over the affected parts with kerosene. If the insect is found to be on the increase a heavy spray with the nicotine solution or kerosene emulsion may be applied late in the season when the insects are on the maller growth.

Scale Insects.

Scale insects are a group of considerable economic importance in southern countries, where many forms do great damage, but only a few species are worthy of notice here. They are usually quite small insects, scale-like or gall-like in form, or grub-like and clothed with wax. The females are wingless and stationery. The males are usually provided with two transparent wings, but as they are very minute and only live a short time after reaching the adult state, they would never be noticed by the casual observer.

The San Jose Scale is well known, at least by name, in all the fruit growing sections of North America. It has recently been introduced into Nova Scotia, but owing to the active campaign waged against it by the Provincial Department of Agriculture it has never made any headway. A rigid inspection is made of all imported stock, so that further danger from infested localities is provided against.

Other scale insects commonly found are the Scurfy Scale (*Chionaspis furfura* Fitch and the European Scale (*Aspidiotus ostreaeforuris* Curtis), but these are kept in check so effectively by their natural enemies that it will rarely be necessary to adopt special control measures against them. The Oyster Shell Scale (*Lepidosophes ulmi* Linn.) is more common than the other species mentioned and, in orchards that are not regularly sprayed, it is sometimes the cause of some loss.

Oyster Shell Scale.

(*Lepidosophes ulmi* Linn.)

The insect gets its name from the shape of its scale, which resembles a diminutive oyster shell, though frequently distorted by overcrowding. The scale is brown in color.

Life History.

The eggs are laid in September and the winter is passed in this state. The eggs are small, oval yellowish bodies, packed closely together under the scale and number, on the average, about 28 for each insect.

A few days after the falling of the apple blossoms the eggs hatch and for a short time the young insects wander actively over the plant, sometimes wandering as far as the fruit. In a short time, however, they settle

down, insert their beaks in the bark and proceed to secrete their scales, after which there is no further movement. There is only one brood per year.

Injuries.

The continued sucking of the juices of the plant by thousands of tiny beaks, finally results in the death of the affected part, and where allowed to go unchecked, large limbs may be destroyed. In very rare instances, the whole tree may eventually succumb. Occasionally, the crowding of the insects on the fruit itself is a source of loss.

Control of Scale Insects.

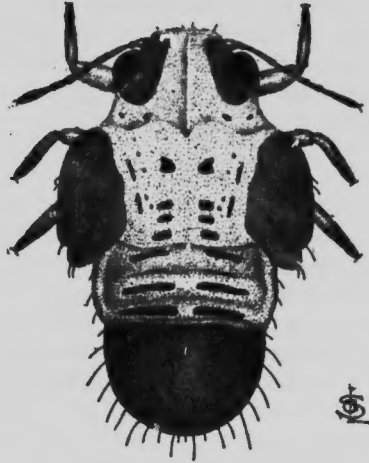
We have seldom found any of the scale insects mentioned making a great deal of headway in orchards that are regularly sprayed for apple scab. If, however, it should become necessary to take special measures, the dormant spray of lime sulphur (commercial wash, about 1-10) should be used, every precaution being taken to cover each insect. If the lime sulphur spray ordinarily applied just after the blossoms fall, be deferred for a few days, it will catch the young of the Oyster Shell Scale as they emerge.

Sodium Sulphide (Soluble Sulphur) and Barium Sulphide (B.T.S.), recently devised dry substitutes for lime sulphur, are also used for controlling scale insects.

The Pear Psylla.

(Psylla pyricola Forster).

The adults of this insect resemble a much reduced cicada in appearance, being only one tenth of an inch in length. In color they are a dark reddish brown, with abdomen banded with black. The wings are transparent, relatively large in proportion to the insects' size and slanted roof-like over the body when it is at rest. The newly hatched young are very tiny, and in fact can scarcely be seen by the naked eye. The appearance of the last stage nymph is shown in the figure.



Full grown nymph of Pear Psylla.

Life History.

The winter is passed in the adult state, the over-wintering adults being smaller and otherwise different in appearance from the summer forms. They conceal themselves in cracks and crevices of the bark, or under leaves and rubbish on the ground. They come out early in spring, with the first warm days and begin to lay their tiny, yellowish eggs upon the twigs. The hatching of the eggs extends over a considerable period, and is largely dependent upon weather conditions, but is usually almost finished by the time the blossom petals fall. The favorite place for the young to feed is the axils of the leaves, but when crowded they may spread out over the petioles and undersides of the leaves. The young insects pass through five immature or nymphal stages before they reach the adult or winged form, the females of which lay the eggs for the next brood. These eggs are laid along the midrib on the underside of the leaf. There are three or four broods a year in Nova Scotia.

Injuries.

Though this insect has been found in several localities throughout the Annapolis Valley, we have never known it to become numerous enough to cause serious damage as yet. In localities where this pest is known it occurs as a more or less periodic pest like the Green Aphis and many other insects, but sometimes it is the cause of great loss. The leaves become brownish or black, wither up and drop

to the ground. The fruit is dwarfed and caused to fall prematurely. In severe infestations the leaves and fruit of infested trees are covered with a sweet sticky substance called honey-dew, which is secreted by the insect. A sooty fungus growing on the honey-dew, gives the tree a very unsightly appearance.

Control.

Scraping off the rough bark from the trees and destroying the rubbish at their base is recommended. A late fall or early spring spray with nicotine sulphate, (Blackleaf 40) when the insects are in their winter quarters and sluggish, is given. It appears, however, that the most satisfactory sometimes method is to give a very thorough spray with this material, shortly after the blossom petals fall. If the work is well done and the greater part of the first brood destroyed, little further trouble should be experienced.

APPLE AND PEAR MITES.

Mites are not, strictly speaking, insects, being in fact more closely related to spiders. They are provided with four pairs of legs, whereas insects only have three pairs. Since, however, the creatures feed in a similar manner to sucking insects, they may appropriately be considered at this point.

The Pear-leaf Blister Mite.

(Eriophyes pyri Pgst.)

These mites are too small to be seen by the unaided eye, being only 1-125 of an inch in length, but their work on both the apple and pear is conspicuous. The winter is passed by the mites under the bud scales, but as soon as the buds burst they leave their winter quarters and begin to burrow beneath the skin of the lower surface of the leaves. The result of this work is the formation of a blister-like gall, which on the pear is at first green, and later red in color. On the apple the blisters are yellowish and greenish and rarely take on the red coloration, characteristic of affected pear leaves. Severe injury may result in premature falling of the leaves. The young fruit is sometimes attacked and, in bad cases, stunted or deformed.

Several generations are produced throughout the summer. The eggs are deposited within the gall and there the mite remains until mature, when it leaves the gall through a tiny opening on the under side, to form a new blister elsewhere.

Control.

The dormant spray of lime sulphur 1-10 (commercial lime sulphur testing 320 Beaume) applied in the autumn after the leaves fall, or in the spring before growth starts is a satisfactory control.

Apple Leaf Mites.

(Phyllocoptes schlectendali Nal. & others)

A conspicuous whitening or silvering of the leaves of the apple is noticed in more or less abundance each year. Some seasons, however, it is very much more common than others. Sometimes the trouble may be confined to a single limb, in other cases the whole tree may be affected. The leaves may be a uniform milky white, or they may exhibit a decided metallic lustre, according to variety. Sometimes too, the leaves are simply spotted or blotched with the whitish or silvery coloration.

If examined under a lens such leaves may be seen to be covered with numbers of tiny mites, whose innumerable tiny feeding punctures have created an air cushion between the skin of the leaf and the underlying cells, and hence their white or silvery appearance. This trouble is very likely to be confused with the fungus, Silver Leaf, (*Stereum purpureum*), the symptoms being almost identical.

It does not appear that these mites result in any serious damage to the tree, but in case most of them are quite easily controlled by the ordinary summer spray of lime sulphur. Where this is not satisfactory, a spray of nicotine sulphate, 1 pint to 100 gals. may be used. Other species, e. g. the Red Spider (*Tetranychus bimaculatus*) are controlled by a spray of flour paste, 4 gals. to 40 water. This particular mite is never sufficiently numerous in our orchards to warrant special treatment.